Plant Turnover and the Evolution of Regional Inequalities

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Abstract

Using a large longitudinal matched employer-employee dataset we produce several measures of within and between groups inequality in Portugal for the 1986-1998 period. We focus our attention on changes in the returns to observable characteristics of workers and test the hypothesis that these changes reflect developments in the labour market. We depart from previous research by shifting focus from the supply side to the demand side of the labour market. Drawing on the results of the by-now large literature on plant turnover we investigate the link between plant entry and exit and changing returns to observable worker characteristics.

KEYWORDS: Wage Inequality, Regional Inequality, Plant Turnover.

JEL CODES: J23, J31, R30.

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1 Introduction

Evidence on the evolution of earnings in the industrialized world unequivocally indicate a rise in inequality during the 1980s and 1990s, which was much more pronounced in the United States and the United Kingdom than in Continental Europe. Although market forces and institutional factors are jointly responsible for changing earnings inequality everywhere, the more limited rise in inequality in Europe is widely attributed to the fact that wage changes are bindingly constrained by wage setting institutions in place there (Blau and Kahn, 1996). More recently, Gottschalk and Joyce (1998) compared trends in inequality in eight OECD countries and found evidence that much of the cross-national differences observed can be explained by market forces. They find that even in countries where institutions are usually thought of as binding, large offsetting supply and demand shifts are sufficient to explain the relative stability of earnings inequality.

The focus on market forces unveiled the role played not only by changes in relative factor supplies, but also by shifts in labor demand. The importance of such demand factors as international trade (Borjas and Ramey, 1995), skill-biased technological change (Berman *et al.*,1994; Juhn, 1999), or the changing nature of firm-level wage-policies (Cardoso, 1999) has been pointed out. Despite the difficulty of singling out one dominant reason for the observed shifts in labor demand (Baldwin and Cain, 2000), there is general agreement that changes in wage inequality reflect an increase in relative demand for skilled workers.

However, we know from a large literature on the turnover and mobility of firms that similar firms in narrowly defined industries, even when confronting similar market conditions, make different (and persistent) choices in terms of the (skill-)

composition of their workforce (Haltiwanger *et al.*,1999).[1] Whereas heterogeneity in productivity and earnings of incumbent firms at any point-in-time may be accounted for by vintage effects (Lambson, 1991), more heterogeneous outcomes for new businesses could be the result of complementary choices entrepreneurs make about technology, organization or managerial ability as part of the "experimentation" process of creating and running a business (Haltiwanger *et al.*, 2000). Allowing for the presence of costs of adjustment of the labor input further explains why incumbent firms - because they are more constrained to maintain their workers-mix - may respond slowlier (if at all) to changes in their business environment and, for this reason, become a source of the observed persistence of workforce composition and stability of the earnings distribution.[2]

This paper explores the extent to which differences in plant turnover are able to explain differences in changes in observable returns to skills. Using a rich longitudinal matched employer-employee dataset, we explore cross-regional variations to identify the causal effects of plant turnover on earnings inequality. To this purpose, Portugal's mainland territory was divided into twenty-eight regions, corresponding to the NUTIII-level division. The focus on regional variations has the advantage of guaranteeing a common institutional support which allows us to concentrate on the role of market forces alone. Besides, because we use data from a single source, full-comparability of results across regions is assured. The analysis spans a 12-year period, from 1986 to 1998, and covers the universe of Portuguese establishments with wage-earners.[3]

[1] For a survey of this literature and of its main results, see Caves (1998).

[2] In extreme cases, labor adjustment costs may bias firms' response to exogenous shocks, towards the entry-exit margin.

[3] Only Public Administration bodies are excluded.

The paper is divided into six parts. The next section describes the dataset that we use to measure earnings inequality and the corresponding changes. Section 3 presents evidence on the changing inequality for twenty-eight regions in Portugal's mainland. In section 4 we deal with regional plant turnover and its impact on labor demand. Section 5 discusses the relationship between changes in labor demand due to business startups and changing returns to college education. The final section concludes.

2 Data Description

The data set of this study was constructed using the data from *Quadros de Pessoal* (*QP*). *QP* is an annual mandatory employment survey collected by the Portuguese Ministry of Employment, that covers virtually all establishments with wage earners.[4] Indeed, each year every establishment with wage earners is legally obliged to fill in a standardized questionnaire. Reported data cover the establishment itself (location, economic activity and employment), the firm (location, economic activity, employment, sales and legal framework) and each of its workers (gender, age, education, skill, occupation, tenure, earnings and duration of work). The information on earnings is very complete. It includes the base wage (gross pay for normal hours of work), seniority payments, regular benefits, irregular benefits and overtime pay, as well as the mechanism of wage bargaining. Information on normal and overtime hours of work is also available.

Twelve spells of *QP*, from 1986 to 1998, were available for this study.[5] From 1986 to 1993 the information was collected in March of each year, and since 1994,

[4] Public administration and non-market services are excluded.
[5] No computer files are available for the year 1990.

in October.

The survey has three characteristics that make it particularly suitable for the analysis of the relationship between wage inequality and plant turnover. First, it covers all firms employing paid labor in Portugal.[6] Second, it has a longitudinal dimension which allows us to follow plants and individuals over time. Third, it contains information on firms, plants and their workers.

3 Changes in Earnings Inequality

In this section we present data on changes in annual earnings inequality for the twenty-eight regions considered. Throughout the analysis we use data on hourly wages and the corresponding distribution. Our focus is on changes observed between 1986 and 1998.

3.1 Changes in the Regional Distributions of Earnings

Table 1 documents changes in the distribution of hourly wages for Portugal as well as summary statistics computed from results obtained for each region. Two different measures are used: the coefficient of variation of the distribution of earnings and changes in the ratio between the 10th, the 50th and the 90th percentiles.

For the country as a whole, the coefficient of variation indicates a small increase in overall inequality during this period (0.2 percent increase per year). Across regions, there are considerable differences both in the starting levels of inequality (in 1986 the coefficient of variation takes on values in the interval between 7.056 and 10.074) and in differences (percentage yearly changes vary from -1.5 percent to 0.8 percent). Regions at the two extremes of the distribution of the coefficient

[6] Thus, this source does not cover operated family businesses without wage-earning employees and self-employment. Public administration is also excluded.

	Coef. of Variation	P90/P10	P90/P50	P50/P10
Tâmega	-0.013	-0.049	-0.016	-0.034
Ave	0.008	0.009	0.019	-0.010
Entre Douro e Vouga	0.005	0.031	0.028	0.002
Pinhal Interior Norte	-0.002	-0.005	0.010	-0.015
Cávado	-0.003	-0.009	0.015	-0.023
Cova da Beira	0.003	0.012	0.032	-0.019
Dão Lafões	-0.010	-0.023	0.004	-0.028
Pinhal Interior Sul	-0.002	-0.004	0.013	-0.017
Serra da Estrela	0.007	0.021	0.032	-0.011
Minho Lima	-0.015	-0.036	-0.006	-0.030
Beira Interior Sul	-0.003	-0.005	0.016	-0.021
Oeste	-0.003	0.007	0.010	-0.003
Alto Alentejo	-0.001	-0.006	0.013	-0.019
Lezíria do Tejo	0.001	-0.002	0.005	-0.007
Alentejo Central	-0.005	-0.014	0.016	-0.030
Douro	-0.004	-0.025	0.007	-0.032
Baixo Vouga	0.002	0.012	0.015	-0.003
Médio Tejo	0.003	0.014	0.015	-0.001
Pinhal Litoral	0.008	0.013	0.015	-0.002
Alto Trás-os-Montes	-0.008	-0.020	0.002	-0.022
Beira Interior Norte	-0.015	-0.039	-0.021	-0.018
Baixo Alentejo	-0.004	-0.009	0.016	-0.025
Baixo Mondego	-0.001	0.002	0.008	-0.006
Algarve	-0.001	0.000	0.006	-0.006
Grande Porto	0.004	0.010	0.008	0.002
Península de Setúbal	0.006	0.018	0.023	-0.006
Alentejo Litoral	0.001	-0.003	0.016	-0.019
Grande Lisboa	0.006	0.022	0.018	0.003
All regions	0.002	0.007	0.014	-0.007

Table 1: Changes in Earnings Inequality - 1986 and 1998.
Yearly Average Percentual Changes

of variation of wages in 1986 exhibit the largest increase in overall within-region inequality.

Changes in the coefficient of variation do not show whether the small increase in wage inequality comes from large offsetting changes at the top and the bottom of the earnings distribution or, if on the contrary, they reflect small changes across the entire distribution.

A more clear picture may be obtained by looking at changes at different points of the earnings distribution. Table 1 also documents relative changes in the 10th, 50th and 90th percentiles. What these figures tell us is that the moderate increase in overall inequality (the ratio P90/P10 rose by 0.7 percent) is the result of a comparatively large increase at the top of the distribution (P90/P50 rose 1.4 percent) only partially offset by a decline in inequality at the bottom (-0.7 percent change in the P50/P10 ratio). This is the pattern of change in earnings inequality we would expect in an institutional setting where binding minimum wage rules apply, as is the case in Portugal.

Regional variation to this overall pattern of change is a matter of degree, not of nature. To the exception of the two greater metropolitan areas in Portugal (Lisbon, Oporto and Entre Douro e Vouga), all regions experienced a decrease in earnings inequality at the bottom. More diversity is apparent at the top where the trend towards greater inequality, although dominant, is by no means exclusive.

3.2 Changes in Inequality between Educational Groups

The small increase in earnings inequality that emerged from the analysis of changes in overall distributions could be the result of small changes in returns to observ-

able characteristics of individual workers or of large changes in returns to some characteristics offset by large opposite changes in other such characteristics. Here, we study how returns to education, especially college education, changed over the period covered by our dataset and how those changes relate to the overall pattern described in the previous section.

To obtain estimates of returns to education we estimate twenty-eight wage regressions, one for each region considered, for 1986 and 1998 (making a total of fifty-six regressions). Employee data were used. The dependent variable in all equations is the log of hourly wages. The set of regressors include controls for the workers' age (linear and quadratic term), gender, tenure (linear and quadratic term), six skill-levels (the omitted category being apprentices) and four educational levels (omitted: less than mandatory schooling). Employer-characteristics are not controlled for to avoid endogeneity, a well-known problem in the economic geography literature. Worker attributes are assumed to be exogenous. This could be a problem if there is spatial selection bias in the unobservables, the most likely candidate being ability. However, given our focus on the dynamics of earnings inequality the problem is relevant only if spatial biases undergo important changes over the period (Duranton and Monastiriotis, 2002). Besides, controlling for qualifications should capture, at least partially, the effects of ability. Results are in Table 2.

For the nation as a whole the evolution of returns to college education exhibit zero net change. However, this result masks significant regional variation with some regions exhibiting increases in returns to college as large as 1.4 percent, whereas other regions experienced a decline which in some cases was quite sub-

	1986	1998	Cum. Perc. Chg.
Tâmega	0.843	0.675	-0.017
Ave	0.63	0.733	0.014
Entre Douro e Vouga	0.821	0.558	-0.027
Pinhal Interior Norte	0.658	0.691	0.004
Cávado	0.847	0.681	-0.016
Cova da Beira	0.647	0.544	-0.013
Dão Lafões	0.808	0.554	-0.026
Pinhal Interior Sul	1.084	0.593	-0.038
Serra da Estrela	0.86	0.745	-0.011
Minho Lima	0.863	0.594	-0.026
Beira Interior Sul	0.705	0.696	-0.001
Oeste	0.925	0.593	-0.030
Alto Alentejo	0.891	0.586	-0.029
Lezíria do Tejo	0.714	0.747	0.004
Alentejo Central	0.69	0.66	-0.004
Douro	0.87	0.853	-0.002
Baixo Vouga	0.602	0.558	-0.006
Médio Tejo	0.824	0.67	-0.016
Pinhal Litoral	0.645	0.65	0.001
Alto Trás-os-Montes	0.648	0.56	-0.011
Beira Interior Norte	1.16	0.548	-0.044
Baixo Alentejo	0.85	0.66	-0.019
Baixo Mondego	0.852	0.728	-0.012
Algarve	0.661	0.576	-0.011
Grande Porto	0.754	0.747	-0.001
Península de Setúbal	0.638	0.681	0.006
Alentejo Litoral	0.841	0.693	-0.015
Grande Lisboa	0.732	0.784	0.006
All regions	0.779	0.775	0.000

Table 2: Changes in Returns to College Education - 1986 and 1998.
Estimates of the coefficients of the College Education Dummy on Regional Log Hourly Wage Regressions. All estimates are significant at 1 percent

stantial (maximum decline reached 4.4 percent). In interpreting these results, we should bear in mind that during this period there was a very substantial increase in the supply of skills, due to heavy public investment in education and the generalization of the 9-year mandatory schooling. Although most of the impact of these changes occurred at intermediade levels of educational attainement, there was also a large increase in the supply of college-graduates.

These results indicate a positive and significant correspondence between the distributions of changes in overall inequality discussed in the previous section and changes in returns to college education. This is especially true for changes in the coefficient of variation (the coefficient of correlation between the two series is equal to 0.56) and in the ratio between the 90th and the 50th percentile (the coefficient of correlation is 0.41), but very much less so for changes in the P50/P10 ratio (coefficient of correlation equal to 0.22). Changes in returns to college education emerge as a source of change in earnings inequality at the top of the earnings distribution, althoug some (weak) evidence on a positive relationship between returns to college and inequality for lower levels of earnings was also obtained.

4 Plant Turnover

In previous sections we documented a moderate rise in overall earnings inequality in Portugal and we found that this could partly be attributed to changes in returns to college education. In this section we focus on plant turnover and explore the hypothesis that the birth of new plants can be responsible for the observed changes in returns to education. In particular, we want to know whether the two margins of growth of labor demand - the start-up of new businesses and the growth of

continuing units - may be responsible in different ways for the changes in returns to college. Are new businesses more intensive users of highly educated workers than are incumbent entrepreneurs? If they are, the proportion of employment growth accounted for start-ups at the regional level should be a major explanation for the increase in returns to college education and thereby for the increase in earnings inequality.

To answer these questions we decomposed regional net employment change into four components - employment growth due to plant births, employment growth due to expansion of continuing plants, employment decline due to contraction of continuing units and employment decline due to shutdowns. Start-ups and shutdowns were identified making use of the longitudinal nature of the dataset we use. An unit is classified as a birth whenever it is the first time it shows up in the dataset and maximum tenure among its employees is less than two years. A shutdown is identified whenever an establishment exits the dataset and does not re-enter in subsequent waves of the survey.

As explained the dataset we use cover the period between 1985 and 2000 with one exception (the 1990 wave). In order to fully control for false entries and exits, employment flows were computed for the period between 1986 and 1998 (with the exceptions of 1990 and 1991), with the data corresponding to the first and two latter years in the sample being used to identify entries and exits in 1986 and 1998, respectively.[7] Results are in Table 3.

In this period, the overall average rate of job creation is 14.4 percent.[8] In the aggregate, 41.2 percent of total job creation is due to new units being created.

[7] For the remaining of this paper we shall look at employment growth (expansions and start-ups)only.

[8] Job Creation is defined as the sum of employment gains at expanding units (births included) divided by the period's average total employment - see Davis *et al.*, (1996).

	Job Creation Rate			% Start-ups
	Start-ups	Expansions	Total	
Tâmega	7.867	9.036	16.903	0.465
Ave	7.194	8.598	15.792	0.456
Entre Douro e Vouga	4.796	6.542	11.338	0.423
Pinhal Interior Norte	4.946	8.172	13.118	0.377
Cávado	8.324	8.787	17.111	0.486
Cova da Beira	4.647	7.397	12.044	0.386
Dão Lafões	8.222	9.264	17.486	0.470
Pinhal Interior Sul	9.523	8.844	18.367	0.518
Serra da Estrela	5.268	8.823	14.091	0.374
Minho Lima	4.43	7.696	12.126	0.365
Beira Interior Sul	7.305	8.546	15.851	0.461
Oeste	7.068	8.574	15.642	0.452
Alto Alentejo	4.731	6.461	11.192	0.423
Lezíria do Tejo	7.297	10.27	17.567	0.415
Alentejo Central	6.491	8.345	14.836	0.438
Douro	8.508	9.171	17.679	0.481
Baixo Vouga	6.016	8.617	14.633	0.411
Médio Tejo	4.8	6.516	11.316	0.424
Pinhal Litoral	7.276	9.082	16.358	0.445
Alto Trás-os-Montes	5.124	8.772	13.896	0.369
Beira Interior Norte	7.781	9.548	17.329	0.449
Baixo Alentejo	5.809	7.939	13.748	0.423
Baixo Mondego	6.595	8.435	15.03	0.439
Algarve	7.28	8.97	16.25	0.448
Grande Porto	10.071	10.439	20.51	0.491
Península de Setbal	8.299	9.606	17.905	0.464
Alentejo Litoral	9.014	8.406	17.42	0.517
Grande Lisboa	10.016	9.926	19.942	0.502
All regions	5.923	8.453	14.376	0.412

Table 3: Job Creation and Plant Turnover, 1986-1998.

These results, which are in line with other previously reported, indicate a larger proportion of all job gains due to entries than is usually found for other countries (roughly one third of the total, according to Hamermesh, 1993).[9]

Regional data exhibit considerable variation. The rate of job creation due to plant openings range from 4.4 to 10.1 percent and its share of total job creation varies between 36.5 and 51.8 percent. Besides, confirming the overall pattern established before for the Portuguese labor market, these results guarantee sufficient cross-regional variation in the two margins of job creation to permit studying the impact of business start-ups on returns to education.

5 Plant Turnover and Changes in Returns to College Education

Our basic research question is: can changes in earnings inequality be attributed to demand-side forces? And, if they can, what is the role of the turnover of plants? To answer these questions we estimate a simple model of the form:

$$RCOL_{i,t} = \beta_0 + \beta_1 PBIRTH_{i,t-1} + v_{i,t}, i = 1, ..., N; t = 1, ..., T. \quad (1)$$

where, the error term writes as:

$$v_{i,t} = e_{i,t} + u_i. \quad (2)$$

$RCOL_{i,t}$ is the estimated returns to college education in region i and year t obtained from wage regressions equations discussed in section 3.2. $PBIRTH_{i,t-1}$ is the proportion of the job creation rate in region i at time $t-1$ that is accounted

[9] This result, also found by Blanchard and Portugal (2001), could be the by-product of large costs of adjustment of the labor input (Varejão, 2003).

	coefficient estimate	t statistic
PBIRTH	0.612	5.904
Constant	0.507	10.668

Table 4: Returns to College Education. Random Effects Model.
$Nobs = 280$ ($N = 28$, $T = 10$); $\hat{\sigma}_u = 0.003$

for by business start-ups. The error term $v_{i,t}$ is the error term that includes a regional time invariant component u_i and a region-specific time-variant component $e_{i,t}$.

Corresponding to a random effects model, we assume that the time-invariant regional specific effect u_i is uncorrelated with the independent variable $PBIRTH_{i,t-1}$.[10] To avoid possible endogeneity of the independent variable, $PBIRTH$, it is included in lagged form.

To estimate the model we construct a longitudinal regional dataset that contains for each pair region×year information on the returns to college education and the proportion of all jobs created by new plants (startups during the corresponding year). Results are in Table 4.

The estimate obtained indicates that an increase by one percentual point in the proportion of new jobs accounted for by business startups increases the returns to college education in the subsequent year by 0.006, approximatelly, 1 percent of the average return to college.

This result illustrate how market forces impact on returns to college education. They indicate that vintage effects may be behind the observed change in returns to college as new businesses are more intensive users of more educated workers

[10] The model was also estimated using fixed-effects which allows for arbitrary correlation between the regional time-invariant specific effect and the regressor. The Hausman test implies rejection of the fixed-effects model in favor of the random effects model. Therefore, only the estimates corresponding to the random effects model are reported. Both convey similar pictures.

thereby putting pressure on their relative wages. This result is even more powerful as it emerges in times of increased supply of college education.

6 Conclusions

In this paper we examine the process through which market forces contribute to shape earnings inequality. Using a large longitudinal dataset we found that small changes in labor market inequality in Portugal were the result of increasing inequality at the top of the earnings distribution. Despite considerable diversity across regions at the top, there is much more homogeneity at the bottom. This indicates that labor market institutions, especially minimum wage laws, are binding.

While there was a small increase in overall inequality, changes in returns to education were virtually zero for the aggregate. This result that is valid for the nation as whole hides substantial cross-region variation. Using regression analysis we conclude that returns to college education may be successfully explained by demand-side mechanisms. Plant turnover and the proportion of total job creation accounted for by plant start-ups generates higher regional returns to schooling. This indicates that, on average, new plants employ more skilled workers than incumbent units. Vintage effects and labor adjustment costs both could explain this result.

References

Baldwin, Robert E. and Glen C. Cain (2000), Shifts in Relative U.S. Wages: The Role of Trade, Technology and Factor Endowments, *Review of Economics and Statistics*, 82 580-595.

Berman, Eli, John Bound and Zvi Griliches (1994), Changes in the Demand for Skilled Labor within U.S. Manufacturing: Evidence from the Annual Survey of Manufacturers, *Quarterly Journal of Economics*, 109 367-397.

Blanchard, Olivier J. and Pedro Portugal (2001), What Hides Behind an Unemployment Rate, *American Economic Review*, 91 187-207.

Blau, Francine D. and Lawrence M. Kahn (1996), International Differences in Male Wage Inequality: Institutions versus Market Forces, *Journal of Political Economy*, 104 791-837.

Borjas, George J. and Valerie A. Ramey (1994), The Relationship between Wage Inequality and International Trade, in Jeffrey H. Bergstrand, Thomas F. Cosimano, John W. Houck and Richard G. Sheehan (Eds.), *The Changing Distribution of Income in an Open U.S. Economy*, Amsterdam: North-Holland.

Cardoso, Ana Rute (1999), Firm's Wage Policies and the Rise in Labor Market Inequality: The Case of Portugal, *Industrial and Labor Relations Review*, 53 87-102.

Caves, Richard E. (1998), Industrial Organization and New Findings on the Turnover and Mobility of Firms, *Journal of Economic Literature*, 36 1947-

1982.

Davis, Steven, John Haltiwanger, and Scott Schuh (1996), *Job Creation and Destruction*, Cambridge (Ma): MIT Press.

Duranton, Gilles and Vassilis Monastiriotis (2002), Mind the Gaps: The Evolution of Regional Earnings Inequalities in the U.K., 1982-1997, *Journal of Regional Science*, 42 219-256.

Gottschalk, Peter and Mary Joyce (1998), Cross-national Differences in the Rise in Earnings Inequality: Market and Institutional Factors, *Review of Economics and Statistics*, 80 489-502.

Haltiwanger, John C., Julia I. Lane and James R. Spletzer (1999), Productivity Reasons Across Employers: The Role of Employer Size, Age and Human Capital, *American Economic Review Papers and Proceedings*, 89 94-98.

Haltiwanger, John C., Julia I. Lane and James R. Spletzer (2000), Wages, Productivity and the Dynamic Interaction of Businesses and Workers, *NBER Working Paper 7994*.

Hamermesh, Daniel S. (1993), *Labor Demand*, Princeton (NJ): Princeton University Press.

Juhn, Chinhui (1999), Wage Inequality and Demand for Skill: Evidence from Five Decades, *Industrial and Labor Relations Review*, 52 424-443.

Lambson, Val Eugene (1991), Industry Evolution with Sunk Costs and Uncertain Market Conditions, *International Journal of Industrial Organization*,

9 171-196.

Varejão, José M. (2003), Job and Worker Flows in High Adjustment Cost Settings, *Portuguese Economic Journal*, 2 37-51.